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EDUCATIONAL NOTE

Cost-Benefit Analysis as a Failure to Learn from the Past

James Broughel
Mercatus Center at George Mason University

Abstract
This short note argues that cost-benefit analysis (CBA), a tool employed by professional economists to evaluate the welfare consequences of public policies, embodies a variety of failures to heed the warnings of famous classical liberal economists. CBA attributes characteristics of individuals to society, fails to adequately account for the "unseen" consequences of policy, wipes out the future with a social discount rate as if "in the long run we are all dead," and is an example of how the pursuit of mathematical logic can lead to failures of common sense. As a result of these problems, CBA offers a useful teaching device for students, demonstrating how even modern-day economists at the top of their profession continue to make basic errors pointed out by economists generations ago. CBA in this context is best thought of as a failure to learn from the past.

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I. Introduction

Cost-benefit analysis (CBA) is a tool widely used in the US federal government and around the world to evaluate the welfare properties of public policies. Economists across the political spectrum endorse CBA as a useful tool to guide decision-making. However, CBA suffers from a number of shortcomings that in other contexts would be thought of as elementary failures to apply basic economic principles. This brief note will outline these shortcomings.

For whatever reason, CBA has not absorbed many lessons learned throughout the history of economic thought, lessons that in this case are most closely associated with classical liberal economists such as F. A. Hayek and Frédéric Bastiat. As a result, CBA presents a useful foil when teaching about common pitfalls in economics, and it

is a practical example of how antimarket ideas tend to become integrated into academic thought.

II. Attributing Characteristics of Individuals to Society

Cost and benefit estimates in CBA generally start out as measures of consumer and producer surplus. For example, when a project produces some beneficial outcome, analysts evaluate what individuals would be willing to pay for it, thereby generating an estimate of the project's benefits. Analysts then subtract the compliance or other costs associated with the project from this amount to assess the project's overall "net benefits."

This procedure may make sense within a single period, but problems arise when making such evaluations across time. To compare surplus measures that accrue in different periods, benefit and cost estimates are entered into a utility function of the form

$$\int_{t=0}^{\infty} \beta U(c_t) dt, \tag{1}$$

where β is a discount factor equal to $e^{-\rho t}$, and ρ is the rate at which the representative agent discounts future utility. The agent is often assumed to have isoelastic utility, such that $U(c) = \frac{c^{1-\theta}}{1-\theta}$. θ, the consumption elasticity of marginal utility, is typically assumed to correspond with the agent exhibiting diminishing marginal utility of consumption.

From the outset, the choice of this utility function is strange because it is unclear exactly whose well-being it is meant to describe. The utility function is sometimes thought to describe the preferences of an infinitely lived representative agent or household (e.g., Liu 2003; Burgess 2013). Some economists are more straightforward in stating that it represents a social planner's preferences or, similarly, that it is a social welfare function that a central planner seeks to maximize (e.g., Drèze and Stern 1987; Nordhaus 2007; Arrow et al. 2014).

Basing CBA on this social welfare function is strange because in other contexts, economists reject the notion that a single social welfare function can describe society's aggregated preferences. This rejection is a result of the influential work of Kenneth Arrow (1950), among others. Ironically, Arrow himself endorsed this social welfare function approach,[1] likely because he was willing to relax at least one

[1] See, for example, Arrow (1999) and Arrow et al. (2014).

of the restrictive axioms that his famous "impossibility theorem" depended upon: in this case, the restriction that no one is allowed to be a dictator whose preferences are always satisfied.

The social welfare function that underlies CBA is an example of the tendency to ascribe characteristics of individuals to society as a whole. This attribution is directly contrary to an assumption central to Austrian economics, which is that only individuals act. CBA is inconsistent with this "methodological individualist" position because it takes the stance that society—or, alternatively, some mysterious social planner who seems to represent society or perhaps each subsequent generation[2]—has time preference and diminishing marginal utility like an individual.

III. Discounting the Future

Consumer and producer surplus estimates arguably have some meaning before they are entered into the utility function in equation 1. But once they have been transformed into units of the infinitely lived agent's utility through the practice of discounting, the meaning of benefit and cost estimates becomes unclear. F. A. Hayek famously warned that the word "social" "has acquired the power to empty the nouns it qualifies of their meaning." He referred to it as a "weasel word" (Hayek 1989). In CBA, the "social" discount rate empties cost and benefit estimates of their meaning because the representative agent's utility has no clear meaning.

Discounting also leads the analyst to wipe out the relevance of future benefits and costs, essentially guaranteeing that CBA emphasizes short-run concerns. The words of John Maynard Keynes are relevant here; he famously advocated for prioritizing short-run concerns with his terse statement that "in the long run we are all dead" (Keynes 1923). Hayek and others chastised Keynes for his short-termism, but CBA comes down squarely on the side of Keynes because it quite literally discounts the future.

IV. Motivated Reasoning

Can a social discount rate be discarded in an effort to account for long-run concerns? Some economists, such as Tjalling Koopmans and William Nordhaus, argue that discounting is necessary to avoid a host of inconvenient outcomes in analysis. For example, they argue

[2] A plausible interpretation of the utility function in equation 1 is that it describes each subsequent generation at time *t*'s preferences, and that each generation gets to be the dictator for the time that it is alive.

that failing to discount would put too much of a burden on the present generation to save for the future (Koopmans 1963; Nordhaus 2007).

But just because one doesn't like the implications of a particular approach does not mean that the approach is wrong. It seems odd to abandon a concrete welfare measure in analysis, such as consumer surplus, for a measure that has no clear meaning, such as a social planner's utility, just because one doesn't like the implications that follow. One should start with a welfare measure that has meaning, then let the chips fall where they may with respect to the policy implications that may follow. Instead, Nordhaus and Koopmans begin with conclusions they find desirable, then proceed to abandon a meaningful welfare measure when it does not align with their predetermined conclusions.

They are not alone. Kenneth Arrow argued on distributional grounds that discounting is necessary, suggesting that a zero discount rate presents an "unacceptable strain on the present generation" and that "it is not morally acceptable to demand excessively high savings rates of any one generation" (K. J. Arrow 1999). Similarly, economist Kip Viscusi, along with coauthors Joel Huber and Jason Bell, has argued that "failure to discount at all by using a zero discount rate generates a variety of undesirable effects," including that "zero discounting places inordinate weight on providing benefits to future generations, who may be more affluent than current generations if real income continues to increase over time. Zero discounting consequently could increase intergenerational income inequality" (Viscusi, Huber, and Bell 2019).

Again, rather than starting from first principles, Viscusi, Arrow, and others start with distributional results they find desirable and then work backwards to identify a discount rate rule consistent with their conclusions. This process is exactly the reverse of how science should work, and it conflicts with a basic view, common among economists, that distributional concerns should be kept separate from issues of efficiency.

V. The Role of Mathematics

Nordhaus and Koopmans also worried about mathematical difficulties that arise with a zero discount rate. For example, the utility function of society may not always rise monotonically with consumption or may not converge toward a bliss point; some values, like the value of capital, may explode to infinity.

These problems are purely mathematical and are not problems of basic logic in the sense of ordinary language. As an example, a zero discount rate also violates the so-called transversality condition in economic growth theory. The transversality condition is necessary to make the optimality problem soluble in an economic growth problem, but there is nothing particularly realistic about this condition. In the words of Robert Barro and Xavier Sala-i-Martin in their textbook on economic growth, "The transversality condition . . . says that the value of the household's per capita assets . . . must approach 0 as time approaches infinity. If we think of infinity loosely as the end of the planning horizon, the intuition is that optimizing agents do not want to have any valuable assets left over at the end" (Barro and Sala-i-Martin 2004).

In other words, the capital stock is assumed to be exhausted at the end of the planning horizon, much as individuals tend to exhaust the bulk of their assets by the end of their lives. But humans as a group do not behave this way, even if individuals often do. The history of human civilization is one where per capita wealth is continually rising. There is no sign that human civilization is planning on gradually consuming all of its wealth.

In fact, an assumption that per capita wealth will simply grow without bound—toward infinity in the limit—is more consistent with everyday experience. But this assumption of continually growing wealth, while reasonable in terms of common sense, is unreasonable in terms of mathematical logic because it means the present discounted value of future wealth is infinite, and so the optimality problem can't be solved with calculus.

Hayek famously warned that the "character of the fundamental problem" confronting the economist can be "obscured rather than illuminated by many of the recent refinements of economic theory, particularly by many of the uses made of mathematics" (Hayek 1945). Put differently, logic in language and logic in math need not be the same. When the two conflict, CBA economists are willing to sacrifice the former for the sake of the latter.

This willingness to disregard common-sense logic is all the stranger because there are relatively easy ways around these problems. George Mason University economist Tyler Cowen has proposed evaluating projects based on their growth rates (Cowen 2007, 2018). If the opportunity cost of capital is infinite, projects can be evaluated based on their rate of return (i.e., the rate of return to

capital). This type of evaluation may even be easier to implement than present practices, as it is precisely what businesses do every day.[3]

VI. The Seen and the Unseen

CBA begins with the analyst measuring consumer and producer surplus values, which are then entered into the social utility function in equation 1. However, not all consumer or producer surplus is alike. The difference between a firm's cost of production and the price it receives for its product comes in the form of profit, some portion of which can be turned into investment. Other surplus, like the benefit derived from looking at a scenic view or holding hands with a loved one, comes purely in the form of an experience.

It is commonly acknowledged that capital investment has to be converted into equivalent units of consumption in CBA, because capital has a higher opportunity cost than an equivalent dollar value of consumption.[4] This conversion is done using a shadow price, which is technically the correct way to account for the "opportunity cost of capital" in analysis, which details how invested resources would grow in value in the future.[5] Martin Feldstein has written definitive work outlining why a shadow price must be used to account for this opportunity cost, as opposed to some other method such as a discount rate (Feldstein 1972). Feldstein argues that issues of opportunity cost measurement and social time preference must be separated and dealt with independently. A discount rate is generally inappropriate for accounting for the opportunity cost of capital because it applies to all benefits and costs, as if consumption and investment-related benefits all grow in value at the same rate. The shadow price of capital, by contrast, applies only to capital.[6]

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[3] The federal government at times follows a similar approach to the private sector. For example, the Trump administration has emphasized financial impacts (and, therefore implicitly, capital and its rate of return) in annual reports on the status of the administration's deregulation efforts. See, for example, OMB (2018).

[4] For example, the Office of Management and Budget (OMB 2003) refers to this as the "analytically preferred" approach in CBA.

[5] At the 2019 Society for Benefit-Cost Analysis conference, this author organized a session titled "Perspectives on the Social Discount Rate," which featured a panel that included Maureen Cropper, Arnold Harberger, and this author. Despite the three panelists holding distinct views on discounting, each agreed that a shadow price is the theoretically correct way to account for the opportunity cost of capital in CBA.

[6] A discount rate is the appropriate way to account for the opportunity cost of capital in financial analysis. But a discount rate works in this case because financial analysis is a special case of cost-benefit analysis where all benefits and costs are like

Despite many economists agreeing that shadow pricing is the correct approach, the shadow price of capital is almost never employed in regulatory CBA. Indeed, even those economists who explicitly endorse the shadow-price-of-capital approach in theory often argue that, in practice, shadow pricing investment is unnecessary (e.g., Moore et al. 2013). This position is difficult to defend because without a shadow price, CBA fails to account for returns to capital that are forgone or created when a government project is embarked upon. This failure is obviously relevant to a famous warning from the nineteenth-century French economist Frédéric Bastiat: "There is only one difference between a bad economist and a good one: the bad economist confines himself to the *visible* effect; the good economist takes into account both the effect that can be seen and those effects that must be *foreseen*" (Bastiat [1848] 1995).

The current practitioners of CBA fail to heed Bastiat's warning. Without a shadow price applied to capital, the unseen consequences of policy go overlooked.

VII. Conclusion: Remembering the Past

The theory that underlies CBA, which draws heavily from growth theory, is truly beautiful in terms of its mathematical sophistication and elegance.[7] But this beauty is merely an illusion. The mathematicians are like magicians who mesmerize the public, journalists, and even other economists with their equations. Mathematics creates a veil that prevents observers from seeing CBA for what it really is.

What is CBA? It is a tool to evaluate the degree to which policies satisfy the preferences of a central planner who theoretically allocates resources across the economy. It frequently ignores the unseen consequences of policy, while simultaneously wiping out the future with a social discount rate. Further, economists at the very pinnacle of their profession (some of whom are Nobel laureates) explicitly set out with predetermined conclusions about what they think is an equitable distribution of wealth and then work backwards, ruling out

capital. In the more general case, where benefits and costs are a heterogeneous mix of consumption and investment goods, a shadow price that applies only to capital is used instead.

[7] For an illustrative example of the mathematical theory underlying CBA, see Drèze and Stern (1987).

assumptions that conflict with their moral intuitions even when it means abandoning a meaningful measure of welfare in the process.

These practices are all the stranger because simpler, more straightforward alternatives are readily at hand and are actively used in both the public and the private sectors. While such approaches could result in a significant shift in policy priorities—toward a focus on capital accumulation, for example—policymakers and academic economists should nonetheless consider moving away from CBA as presently practiced and toward these alternative methods.

At first glance, CBA looks scientific. But a closer examination reveals that it is a tool to justify certain moral imperatives, rather than a tool to objectively describe the actual trade-offs society confronts each time a policy intervention is considered. Furthermore, those who produce and use CBA fail to heed the lessons of brilliant economists from the past. As a result, CBA offers a useful teaching device to students, both as a warning about what happens when we fail to learn from history and as an example of how antimarket ideas tend to poison economic discourse at its most foundational levels.

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